SITING CRITERIA FOR ONSHORE FACILITIES FOR OCS DEVELOPMENT SUPPORT AND THEIR POTENTIAL APPLICATION IN NASSAU AND SUFFOLK COUNTIES.

FEB 1977

Coastal Zone Management Program

SITING CRITERIA FOR ONSHORE FACILITIES FOR OCS OIL DEVELOPMENT SUPPORT AND THEIR POTENTIAL APPLICATION IN NASSAU AND SUFFOLK COUNTIES

Task 8.6

Contract Number D93781

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February 28, 1977

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SUMMARY

A. This report consists of two parts,

1. Siting Criteria

2. Application of Siting Criteria to Nassau and Suffolk Counties.

B. Part 1, Siting Criteria, reviews fourteen different types of onshore facility, and considers each from the point of view of three considerations:

1. Land and Waterfront Requirements (Table 1).

2. Supply Requirements (Table 2).

3. Employment (Table 3).

C. Much of the information is drawn from studies performed by the New England River Basin Commission, and is consequently rather strongly related to potential development of the Georges Bank Trough (11). The Baltimore Canyon Trough lies approximately the same distance from Long Island as Georges Bank, in similar water depths, and subject to the same climate. It is unlikely that onshore support for development of the Baltimore Canyon will differ in any significant way.
In order to provide a time frame for development, a "high find" scenario for Georges Bank has been used (10).

D. In Part 2, the material developed in Part 1 has been applied to Nassau and Suffolk Counties.

E. Possible sites for some types of onshore facility have been identified, whereas, for other types of facility, no sites appear to be feasible. In the latter cases, it can be for several reasons. Among these are:

a) Inability to find a sufficiently large parcel of land zoned industrial.

b) Unacceptable environmental impacts

c) Insufficient water access depth and frontage

F. The possible sites are as follows:

a) <u>Fort Pond Bay</u>, Town of East Hampton, Suffolk County

Might accommodate:

i. Temporary Base for Exploratory Drilling

ii. Temporary Base for Platform Installation

iii. Temporary Base for Pipeline Laying

iv. Permanent Service Base

v. Pipecoating Yard.

b) Village of Greenport, Town of Southold, Suffolk County.

Might accommodate:

i. Temporary Base for Exploratory Drilling

ii. Temporary Base for Platform Installation

iii. Temporary Base for Pipeline Laying

iv. Boat Repair and Maintenance Yard

c) Village of Port Jefferson, Town of Brookhaven, Suffolk County

Might accommodate a temporary base for exploratory drilling.

d) Village of Freeport, Town of Hempstead, Nassau County

Might accommodate:

i. Temporary Base for Exploratory Drilling

ii. Permanent Service Base

iii. Boat Repair and Maintenance Yard

e) Oceanside, Town of Hempstead, Nassau County

Might accommodate a temporary base for exploratory drilling.

f) Yaphank, Town of Brookhaven, Suffolk County

Might accommodate a gas treatment plant.

g) Shirley, Town of Brookhaven, Suffolk County

Would accommodate the landfall for the gas pipeline supplying the above plant.

G. It is to be understood that permission to install any of the above facilities must be secured from the local authorities concerned. In addition, the only land in public ownership is the Freeport site, and the pipeline landfall and right-of-way at Shirley. All the rest is privately owned.

1. SITING CRITERIA

1.1 Introduction

The exploitation of oil fields on the outer continental shelf is treated, in much of the literature on the subject, under three headings, namely:

Exploration

Development

Production

1.1.1 Exploration

On the basis of preliminary studies performed by the U.S. Geological Survey and the oil companies, a given offshore area will have been identified as overlying potentially oil-bearing formations. The U.S. Government will then sell leases to portions of the area to various interested parties, who then proceed to explore their respective tracts. Exploration involves the drilling of a limited number of wells to determine whether further development is indeed worthwhile, and, if so, which would be the best location or locations at which to place production facilities.

In order to support the exploratory drilling effort, a base is needed at some point on shore convenient to the area of operations. If exploration is unsuccessful, the base will be closed down in a few years. If successful, a larger base will be needed, and, again, the temporary one will be phased out in a few years.

1.1.2 Development

Having decided that further development is desirable, the oil company authorizes the construction of offshore platforms, and proceeds to install them when built. Construction takes place onshore, in a waterside factory, from which the partially completed structures are towed by tug to the selected sites, and installed. The latter activity is not a simple one, and is carried out with support from an onshore base reasonably close by.

Mounted on the platform are one or more drilling rigs, which are used to drill so-called "development" wells. These will be the production wells, if flow rates are satisfactory. During the development period, well-drilling activity will proceed at a level far higher than during exploration. The support required for these operations is of the same kind as was required during exploration. However, a larger service base is required, because of the greater quantities of materials to be handled, and the larger crews to be transported.

1.1.3 Production

Production normally begins long before development drilling is completed. (In fact, exploratory drilling often continues long after the first production platforms are in place.) At some point, a decision will be made by the oil company to build or not to build, a pipeline. This is based strictly on economic factors, such as expected yield, distance to shore, costs of shipping by tanker, and so on. If the decision is made to build a pipeline, a pipecoating yard is set up, in which lengths of pipe will receive a coat of corrosion-resistant material, and, if necessary, a coat of concrete. The latter is often needed to provide the mass required to weigh the pipe down and keep it in place on the sea-bottom. Once coated, the lengths of pipe are ferried out to the pipeline laying area by barge. However, pipeline laying is also a complex operation, and support is required from a convenient onshore base. If gas is found in commercial quantities, it too would go ashore by pipeline.

Crude oil leaves the well in association with brine and natural gas. Unassociated gas is sometimes found, but this too will have brine with it. Separation of these components, and some degree of purification, is desirable before the oil and gas are transported ashore. Such a partial treatment plant is therefore often located on the offshore platform. However, for economic and/or technical reasons, it could be located ashore.

Crude oil, whether brought ashore by tankers or pipeline, requires refining, and, under certain circumstances, it would be advantageous to build an oil refinery. Products other than gasoline, kerosine, and fuel oils, could serve as feedstocks for a petrochemical plant.

Crude natural gas is a mixture of methane with other hydrocarbon gases. The methane is separated and fed into the natural gas distribution system. The other components will provide liquified petroleum gas (LPG) and petrochemical feedstocks. This separation is performed in a gas treatment plant, located onshore and fed by gas pipeline.

The economic framework in which an oil company operates may make it advantageous to build an oil storage terminal on shore. This could either receive oil by pipeline from the offshore oilfield for transhipment into tankers, or by tanker from the offshore field for transhipment elsewhere by tanker and/or by overland pipeline.

1.1.4. Miscellaneous Facilities

Many boats will be employed in transporting personnel, supplies and waste materials to and from offshore rigs, platforms, pipelaying barges, etc. They must operate in all weathers, and will require constant maintenance and repair. It is rather unlikely that an oil company will build a boat yard from scratch. However, such facilities as already exist in the area will expand in response to the demand, and return to previous levels of activity when the demand ends.

Some oil companies may also find it desirable to locate one of their top executives in the area close to the offshore fields, in order to provide better supervision of all activities, both on-and offshore. In that event, a district office might be set up for the purpose.

1.1.5. List of Facility Types

From the foregoing, the following types of onshore facilities can be identified:

1. Temporary Base for Exploratory Drilling
2. Temporary Base for Platform Installation
3. Temporary Base for Pipeline Laying
4. Permanent Service Base
5. Pipeline Landfall
6. Marine Terminal
7. Partial Processing Plant
8. Gas Treatment Plant
9. Oil Refinery
10. Petrochemical Plant
11. Platform Fabrication Yard
12. Pipecoating Yard
13. Boat Repair and Maintenance Yard
14. District Office

Each of these types has certain requirements for acreage, waterfront, personnel, etc., etc., and has certain environmental impacts. The facility types are reviewed below in turn, and their needs assessed. Table 1 summarizes land and waterfront requirements and boat traffic. Table 2 summarizes supply requirements and land and air traffic. Estimates of manpower needs are listed in Table 3, where an attempt has been made to assess how many people might be recruited locally, and how many would have to be brought in from elsewhere.

1.2 Temporary Base Supporting Exploratory Drilling

1.2.1 Land and Waterfront Requirements

Exploratory drilling will begin about one year after lease sale, and will continue for 12 or 13 years, long after platforms have been installed in the area, and production has begun. In fact, exploratory drilling may continue at a low level of activity for several more years. However, at a certain point, servicing of exploratory drilling will be taken over by the permanent base. On the other hand, if exploratory drilling is unsuccessful, it will be discontinued at some point. These considerations lead to the expectation that a temporary support base will be occupied for no more than 4 or 5 years.

As Table 1 indicates, 5 acres of waterfront land will be required per rig, with a dockside frontage of 200 feet, and 15 to 20 feet minimum water depth. The base must be accessible to boats in all weathers, 2 or 3 supply boats and one crew boat being required per rig. When several rigs are served, there are economies of scale and the requirements of land, waterfront and number of boats per rig are lowered.

1.2.2 Supply Requirements

The base has to provide substantial quantities of various supplies to the offshore rig, in order to keep it in operation. These include mud, cement, chemicals and freshwater (non-potable) for the drilling mud that is used for flushing rock chips out of the drill hole, pipe for extending the drill shaft and lining the well bore, and fuel oil for driving the drilling rig. In addition, potable water and food are needed for the crew, tools and parts are needed for maintaining machinery, and substantial quantities of fuel are required for the service boats.

Quantities required, per rig per year, when drilling four wells per year, each 15,000 feet deep, are as follows:

4,740,000 gallons of non-potable fresh water
460,000 gallons of potable fresh water
12,800 barrels of fuel oil for service boats
13,272 barrels of fuel oil for drilling
3,828 tons of mud cement and chemicals
1,820 tons of pipe.

Electricity needs at the temporary base are only those for housekeeping.

Road and rail access (as well as sea access) is necessary for bringing these materials to the base, and non-bulk items (i.e., other than water, fuel, pipe, etc.) have to be flown to the rig by helicopter. In bad weather, when the crew boat would find it difficult to tie up to the rig, replacement crews would also be helicoptered in and out. Thus, easy access to a passenger airport would also be useful.

1.2.3 Employment

A total of about 45 people would be required for each exploration rig deployed. Six of these would be wharf and warehouse hands, three are helicopter crew, and most of the remainder are boat crewmen. Of the total, about 33 could be hired locally.

On the offshore rig, 122 people would be employed, of whom 85 to 90 would compose two alternating drilling crews, 12 would be geophysical technicians, 15 would be catering and service staff, and the remainder would be employed in mixing and handling drilling fluids, and associated activities. Approximately 45 members of the offshore crews could be hired locally.

1.3 Temporary Base Supporting Platform Installation

1.3.1 Land and Waterfront Requirements

The oil company determines its platform requirements from the results of several years of exploratory drilling. Consequently, the deployment of platforms will not begin until about the fifth year after lease sale. Hence, a temporary support base will start up in year 5, and will remain in operation for about 8 years.

The platform structure and components will be fabricated elsewhere, so that the support base itself supplies only the basics of food, water, and fuel, and those materials, such as welding rod, which are required for platform assembly. Thus, an area of 5 acres provides all the storage space required for handling the installation of as many as four platforms simultaneously, together with helipad and office building.

Waterfront needs are substantial. A minimum of 200 feet is required, plus 200 feet more for each platform being installed. Water depth is the same as for exploratory drilling, i.e., 15 to 20 feet. However, some of the support vessels, such as derrick barges, are much larger, and require a broad maneuvering area, i.e., an entire habor area is necessary at that depth, not just a channel. Most of the traffic will come from the usual supply and crew boats, and visits to the dockside by the more ungainly barges will be rare, but the maneuvering space must be available.

Steel and concrete platforms, by the nature of their respective designs, generate different levels of boat traffic. Each steel platform requires one supply boat and one crew boat, whereas a concrete platform requires six workboats and three or four barges of 400 ton size.

1.3.2 Supply Requirements

As indicated in Table 2, fresh water, fuel and power are required, but in quantities not known at present. Fresh water is not required for the actual offshore platform assembly operations, but only for personnel needs. Thus it can be roughly estimated on the basis of 100 gallons per day for each man employed in the base, on the boats and offshore, bearing in mind that offshore crews are duplicated, and therefore that some fraction will be on leave at all times.

Fuel requirements will depend on whether steel or concrete platforms are involved. As mentioned above, the latter employ many more service boats than the former.

Electricity requirements are only for base housekeeping.

Road, rail and air traffic follows a pattern similar to that for a temporary base supporting exploratory drilling.

1.3.3 Employment

Figures are not available for bases supporting concrete platform installation, but for steel platforms, approximately 25 men are required per platform. Thus, for a base supporting the installation of 4 steel platforms, the average annual employment is 86, and the peak is 118. Job categories are the same as those for exploratory drilling, namely 6 wharf and warehouse men for each platform being installed, three helicopter crewmen, and the rest boat crews. Roughly 70 percent can be local hires. The operations offshore require many more men, an average of 1,043 and a peak of 1,360. Of these, 25 percent can be local hires. Most offshore personnel will be steel riggers, welder, etc.

1.4 Temporary Base Supporting Pipeline Laying

1.4.1 Land and Waterfront Requirements

The economic justification for installing a pipeline will become evident only after production has begun. At that time, the first production wells will be evaluated, and a better idea obtained of the potential of the entire field.

It is unlikely that each individual oil company will build its own pipeline to shore. In fact, there is a precedent, from the Shetland Island field in the North Sea, for every company participating in the field's exploitation to join together in financing one main pipeline, connected to each platform by a branch line.

Consequently, pipeline laying will run in tandem with platform installation, beginning some 2 years after the first platform goes in, and ending 2 years after the last one. Thus, a temporary base for pipeline laying will be in use from year 7 to year 15 after the lease sale (see Table 1).

Since coated pipe will be barged directly from the pipecoating yard to the lay barge, the temporary base does not have to provide storage for it. Five acres is sufficient for all the storage needed, plus a one acre helipad and office building.

Waterfront needs are similar to those for a platform base, i.e., 200 feet minimum, plus 200 feet for each lay barge operating out in the ocean. Water depth and maneuvering room are also the same as for the other. One supply boat and one crew boat are needed to serve each lay barge. The latter is accompanied by a "spread" of other vessels. These include barges supplying pipe to the lay barge, a jet barge to dig a trough on the sea bottom in which the pipeline is laid, and a fleet of tugs for maneuvering them all. The spread has little impact on the shore base, however. Pipe barges will "commute" to and from the pipecoating yard, and the lay and jet barges will remain at sea until the pipeline is completed.

1.4.2 Supply Requirements

Fuel requirements for the lay barge and jet barge are substantial, being 50,000 and 180,000 gallons per month, respectively. The fuel required for the service boats depends on the distance from shore and the frequency of trips. Potable water and food are required for personnel, and tools and parts are required for maintenance. Electricity is needed only for base housekeeping.

Road, rail, and air traffic will be approximately as for an exploratory drilling base.

1.4.3 Employment

Approximately 25 men are employed for each lay barge in operation. For a laying rate of 300 to 350 miles of pipe per year, average base employment will be 36, with a peak of 61. Job categories are the same as for an exploratory drilling base, i.e., six wharf and warehouse house for each pipeline being laid, three helicopter crewmen, and the rest boat crews. 70 percent could be locally hired. Offshore, average employment will be 540, with a peak of 923. Of these, 20 percent will be local. The offshore personnel are crew members of the lay and jet barges and the associated vessels. The lay barge will carry pipe welders.

1.5 Permanent Service Base

1.5.1 Land and Waterfront Requirements

Permanent bases provide support to offshore platforms during the phases of development drilling, production, and workover. The last phase involves re-working existing wells which have been producing for some years. There is usually a gradual drop in flow rate with time, and flow can be boosted somewhat by working over the well.

Base activity is greatest during development drilling and least during production, but the "permanent" base will remain in operation until the field is exhausted, i.e., from about year 6 to year 31 after the lease sale. By about year 3, however, the viability of the oilfield will have been proven, and the permanent base will start gearing up then, even though the first platform installation is still 2 years in the future.

Land requirements will range from 50 to 70 acres, depending on the number of platforms served. There will be office space, and a one acre helipad for each platform.

200 feet of waterfront will be needed per platform (or rig, when the later phases of exploratory drilling are transferred to the permanent base, and the temporary base is phased out). There will be economies of scale, i.e., four platforms will require 600 feet of dockside. Water depth of 15 to 20 feet is needed, with access in all weathers.

During development drilling, each platform will require 4 supply boats and one crew boat. Again, there will be economies of scale. Thus, 5 platforms will require 15 supply boats. During production and workover, no more than one supply boat will be needed for each two platforms. By that time, platform crews will be so small that it will be more convenient to transport them by helicoptor, and no crew boat will be necessary.

1.5.2 Supply Requirements

The maximum supply activity will occur during development drilling, and will depend on the number of platforms served, the number of drilling rigs on each platform, and the number of wells drilled. For one platform, carrying two rigs, and drilling 8 wells per year, each 15,000 feet deep, the following supplies will be delivered offshore per year:

460,000	gallons of potable water
7,740,000	gallons of non-potable fresh water
28,560	barrels of fuel oil for drilling
6,488	tons of mud, cement and chemicals
3,816	tons of pipe.

In addition, there will be food, tools and spare parts, and about 25,000 barrels of engine fuel will be supplied to the boats.

During workover, each well reworked will require a total of 520,000 gallons of fresh water, 2,000 barrels of fuel oil for drilling, 66 tons of mud, etc., and 2 tons of pipe. Boat fuel requirements, during production and workover will be about 19,200 barrels per year.

Electricity requirements are merely for base housekeeping.

Road, rail and air traffic will be approximately as for an exploratory drilling base.

1.5.3 Employment

Estimates are available only for base employment during development. An average of 53 people will be required per platform, and a peak of 116. Of these, approximately 75 percent can be local hires. As for temporary bases supporting exploratory drilling, most permanent base employees are boat crewmen. Three are helicopter crew, and six are wharf and warehouse hands. Employment will be substantially less during production and workover.

1.6 Pipeline Landfall

1.6.1 Land and Waterfront Requirements

During the approximately 8 years of pipeline laying, it would logical to run the main line ashore early in the program, so that oil pumping can begin as soon as possible. There is a proven procedure for connecting in branch lines later, as necessary. It is assumed, therefore, that the actual landfall will be constructed in the first 2 years of pipeline laying, i. e., from year 7 to year 9 after the lease sale. The main pipeline will then operate for the remaining lifetime of the field.

The landfall should be located where the sea bottom approach is gently sloping, with sufficient depth of sand or shingle to provide 10 feet of cover for the pipeline down to mean low water, and 7 feet of cover from there out to the 50 foot water depth contour. A gentle transition from beach to land is preferable, although a cliff even as high as 100 feet is acceptable, if its composition is soft. The width of waterfront required is less than 100 feet.

Both oil and gas can be conveyed ashore by pipeline, and each presents different problems. Both may require a boost in pressure at this point, i. e., a pumping station for oil and a compressor station for gas. Whereas the landfall itself can be repaired to the extent that it can be rendered invisible, a pumping station or compressor station would be highly intrusive near the shoreline. If the area is already deteriorated, this may not be considered a problem.

There will be pumps and compressors on each platform, and if partial processing takes place there (see below), boosting stations may not be necessary. This is more likely for gas than for oil. Hence, a pumping station associated with an oil pipeline landfall is more probable than a gas compressor station associated with a gas pipeline landfall.

Forty acres is the estimated requirement for a pumping station handling 200,000 barrels per day of oil.

1.6.2 Supply Requirements

An operating pipeline landfall is a passive installation, and requires no supplies. Construction data is not available. Supply requirements for an oil pumping station are also not known.

1.6.3 Employment

Approximately 50 men will be employed in landfall construction, of whom 80 percent may be locally hired. The figures for the construction of an oil pumping station are not available, but 17 people would be employed in its operation, and 14 of them could be hired locally. The operation crew would consist of a supervisor, four gaugers, six roustabouts, two technicians and four dispatcher clerks.

1.7 Marine Terminal

1.7.1 Land and Waterfront Requirements

A marine terminal could be employed in one of two basic ways. One is to store oil received by pipeline from offshore wells, and load it into tankers for shipment by sea to a remote refinery. The other is to receive and store oil brought in from offshore wells by tanker, and pump it, via overland pipeland, to an adjacent or remote refinery.

The decision to build a marine terminal, for either purpose, is an economic one, as far as the oil company is concerned. However, the siting and construction of marine terminals is a complicated political process because of environmental considerations. Statistics indicate (2) that the major source of oil pollution, worldwide, is normal tanker operations, i.e., tank cleaning and ballasting. U.S. Coast Guard regulations require that new tankers larger than 70,000 deadweight tons (DWT) have segregated ballast tanks, so that ballast water be excluded from the cargo tanks. This is somewhat larger than the class of vessels considered in this context, however. (See below.)

Given that a marine terminal is shown to be feasible, it would have to be operational from approximately year 13 after the lease sale, and remain in operation until the oilfield was shut down.

The land area requirements for a terminal depend on the amount of oil to be stored, and that is a matter of economics, tanker size and scheduling, refinery capacity, and so on. A tank farm for one million barrels of oil occupies about 17 acres. For three million barrels storage capacity, 50 acres would be needed. Another 40 acres would be used for pipeways, transfer equipment, boiler house, electrical sub-station, administration building, and other services.

Waterfront requirements depend on whether the unloading facility is of the shoreside fixed pier type, or the offshore mooring type. In the latter case, the tank farm can be set back from the shoreline, and the actual waterfront corridor can be minimal. In the shoreside case, the waterfront requirements would depend on the maximum size of tanker to be handled. Table 1 lists information for a 40,000 DWT tanker, simply because this is the size of vessel cited in the draft environmental impact statement that was written for Lease Sale Number 42, Georges Bank Trough (4). Thus approximately 1,000 feet of waterfront is cited, and 40 foot water depth.

1.7.2 Supply Requirements

Marine terminals have fairly modest fuel and power requirements. A one million barrel tank farm would consume 8 million kwh per year, which is equivalent to an average connected load of 900 kw, approximately. The installed load would be 2-3000 kw. A two million barrel tank farm would consume 14 million kwh per year. All other services would require 850,000 kwh per year.

Total fuel oil consumed is 12,200 barrels for terminals of this order of magnitude. In addition, fresh water, tools and spare parts would be needed for general housekeeping and maintenance. Supplies would be brought in by road, or by rail if the quantity demanded it.

1.7.3 Employment

The operation of the terminal would require 35 people, of whom 25 could be hired locally. Job breakdown is approximately as follows: 2 administration, 21 marine and navigational, 7 oil transfer, 2 maintenance, 1 lab. technician and 2 security guards. Construction would employ about 565 people, and 20% of these could be locally hired.

1.8 Partial Processing Plant

1.8.1 Land and Waterfront Requirements

Crude oil at the well-head contains natural gas and formation water. The latter is brine, with a high concentration of dissolved and suspended solids. Some of the formation water will be mixed with oil in an emulsion. The water and sediment content of the crude must be reduced to 1 percent or better as soon as possible after leaving the well, because of the corrosive nature of the brine. In addition any natural gas associated with the crude oil will "boil" off as the oil pressure drops from the formation pressure, as it rises up the well. The separation of gas and brine from the crude oil to acceptable levels of purity is called "Partial Processing".

This is sometimes done at the offshore platform, where it adds, of course, to the platform cost and the complexity of offshore operations. If tanker is the method employed to convey oil to the shore, then partial processing would be done at the platform. If a pipeline is used instead, then partial processing could be done either on the platform or on shore. If the latter case, the plant would probably be located inside the marine terminal boundary.

After separation, the water will require treatment to reduce its oil content to 20 to 50 parts per million, to render it acceptable for discharging.

The natural gas found associated with oil would be one of the products of the partial processing. If non-associated gas is found, it will still have formation water associated with it, and will require separation, to a fairly high degree. Water vapor can condense in long pipelines, causing slugs which increase pipe friction, and thus reduce pipe capacity. Also, moisture in natural gas can react to form bulky solid hydrates, capable of plugging lines and equipment. Consequently, partial processing of gas is more likely to be done on the offshore platform than partial processing of oil.

For an onshore plant to handle 100,000 barrels of oil per day, a site of about 15 acres would be needed. There would be no specific waterfront requirements. In the general scenario considered in this report, production would commence in the 6th year after the lease sale. Construction on the partial processing plant would therefore have to start a year earlier.

1.8.2 Supply Requirements

Data available is for a plant of one-third the capacity cited above. It would use 10,000 gallons of fresh water per month, which considering the number of operators involved (see below), would appear to be mostly for drinking and sanitary purposes. 1.5 million cubic feet of fuel gas would be consumed per day, and 400,000 kwh of electricity per month, the connected load being approximately 700 kw. Maintenance supplies would also be required. The crude feed would be brought in by pipeline, and processed oil and gas would depart by the same method.

1.8.3 Employment

The partial processing plant would require an operating staff of only 10. At the beginning, these would probably all be brought in from outside the area.

Construction would require 150 people, of whom some 20 percent might be hired locally.

1.9 Gas Treatment Plant

1.9.1 Land and Waterfront Requirements

As mentioned previously, the gas fraction leaving a well is a mixture of methane and other light hydrocarbons. The latter have properties making them worthwhile separating from the methane, and splitting into two basic streams. One stream, essentially propane and butane, has a market value as liquefied petroleum gas (LPG). The other stream, containing ethane and a number of unsaturated compounds (ethylene, propylene, etc.), would be a suitable feedstock for a number of important petrochemical products, such as ethylene oxide, artificial rubber, and many others.

Until exploratory drilling takes place, however, the actual flow rate of the crude gas, and its composition, cannot be known. There is a gas flow rate below which it is uneconomic to pipe the gas ashore at all. In that event, it would be re-pressurized and pumped back into the oil-bearing formation, in order to maintain the crude oil production rate. Above that flow threshold, gas production would be developed, but failing a knowledge of the distribution of the components in it, the specific processing scheme of the gas treatment plant cannot be known. In general, condensibles would be separated from non-condensibles by refrigeration. The non-condensible fraction (mostly methane) would be fed into the natural gas pipeline, and the condensible fraction could be split up into components by low-temperature distillation.

It can be said, however, that a plant to process one billion cubic feet of gas a day would require approximately 75 acres, of which 20 acres would be occupied by buildings, structures, and processing equipment. The remainder is open storage, parking and buffer space.

A smaller capacity plant would not occupy proportionately less acreage. For instance, a plant for processing 200 million cubic feet of gas a day would still need 50 acres, approximately.

The nature of oilfield operations is such that oil production builds up some years before gas production does, and continues for some years after gas production ends. The gas treatment plant will therefore be in operation from year 10 to year 28 after the lease sale, compared to oil production, which will run from year 6 to year 31.

There is no need for a waterfront location for this type of facility.

1.9.2 Supply Requirements

Fuel, power, and water requirements are substantial. A plant to process one billion cubic feet of gas a day will consume 360 million cubic feet a month of fuel gas and 5.4 million kwh a month of electricity. The latter implies an average load of 7,500 kw, which, in turn, implies a connected load of 10 to 20,000 kw. Water consumption would be 200,000 gallons per day, mostly in process cooling. These quantities imply that the pure natural gas produced is not liquefied.

Gas feed and product enter and depart by pipeline. LPG will be shipped out by tank car and tank truck. Other gaseous products could be pipelined to a petrochemical plant.

1.9.3 Employment

Operation of a one billion cubic foot day plant would require approximately 50 personnel, of whom 30 could be locally hired. The jobs break down as follows: 5 supervisory, 12 technicians, 20 operators, 11 maintenance, 2 contract service.

Construction would employ a peak of 550 people, half of whom would be locally hired.

1.10 Oil Refinery

1.10.1 Land and Waterfront Requirements

Like marine oil storage terminals, the siting of oil refineries is subject to powerful, political constraints, by virtue of the significant impact they cause, both in construction and operation (see below). This is clear from the unsuccessful attempts by a number of companies, over the past decade, to locate an oil refinery in New England.

Oil refineries require very large amounts of land. A plant to process 250,000 barrels of crude oil per day would occupy approximately 1,000 acres. Of this, the actual processing units would require 200 acres, and another 400 acres would be used for buildings, tank farm, boiler house, cooling tower, and auxiliary services, such as water treatment, waste treatment, etc. The remaining area would be buffer space.

The size of refinery actually built would be determined by economic considerations, and, under certain circumstances, a capacity as low as 50,000 barrels of crude oil a day could be economic. However, the land requirements are not proportional, i.e., such a plant would require much more than one-fifth the acreage of a 250,000 barrel a day plant.

Refineries have often been located at the shoreline, adjacent to the oil-receiving terminals. However, there is nothing inherent in their design or operation that demands a waterfront location, and they can just as well be fed by an overland pipeline.

Large and complex plants of this kind have long construction times. A grass-roots refinery, that is, one built from scratch, would require three years to build. The scenario followed in this report would require a refinery to be in operation at year 9 after the lease sale. Hence construction would begin during year 5.

1.10.2 Supply Requirements

An oil refinery of the size cited above, 250,000 barrels per day, would consume large amounts of water, fuel and power.

These plants have extensive cooling requirements, and usually employ water for the purpose, using a closed-circuit system with a cooling tower. Even so, there are considerable evaporation losses and make-up requirements, up to 5.4 MGD.

Fuel oil is consumed in the boilers used for supplying process steam, and in the fired heaters which heat or vaporize various hydrocarbon streams at various stages in the process. The amount consumed depends on the actual processing scheme, which, in turn, depends on the composition of the crude, and the "pattern" of products that the market requires. However, fuel oil requirements will probably amount to over 24,000 barrels per day.

Refinery processing is an intricate network of distillation towers, heat exchangers, fired heaters, catalytic crackers, etc., etc. Hundreds of pumps, fans, compressors and other kinds of machinery are required to circulate liquids and vapors through the system, and each needs an electric motor. The total connected load would be approximately 100,000 kw, with a total daily consumption of 1,818,000 kwh.

Crude oil feed would enter the refinery by pipeline, and most of the large-volume products could depart by the same means. Low-volume products would be shipped by tank car and/or tank truck. Operating supplies, tools, and spare parts would be brought in by road or rail.

1.10.3 Employment

A large labor force would be employed in construction. The annual average would be 2,180 people, of whom 70 percent could be hired locally. This fraction could rise to 80 percent.

Operation would require an annual average of 435 people, of whom about 86 percent could be hired locally. 70 percent of the total workforce will be in operations and maintenance, 20 percent in administration, and the remainder will be safety, security and laboratory personnel.

1.11 Petrochemical Plant

Such a plant would receive liquid and gaseous feedstocks from the oil refinery and the gas treatment plant, and process them into fertilizers, plastics and other products. There is an enormous choice of processing schemes, and the one selected would depend on what markets were to be served.

At this time, no information is available to define this type of facility further.

1.12 Platform Fabrication Yard

1.12.1 Land and Waterfront Requirements

Platforms for offshore oil production can be built of steel or of reinforced concrete. Steel platforms are usually of the fixed-piling type, in which the operating platform is supported well above the ocean surface by legs which are fastened to the sea-floor by steel pilings. This is the commonest type of steel platform, but there are at least two other designs. One is the gravity platform, which rests in place on the sea bottom, by virtue of its own mass. Essentially, the operating platform is supported above an arrangement of tanks. The structure is floated out to the desired location, the tanks are flooded, and the whole assembly settles down into its assigned place. Another steel platform design is the tension-leg type, in which the operating platform actually floats, and is held in place by anchors and cables. The downward pull of the cables submerges the platform somewhat deeper than its own unrestrained buoyancy would allow, and imparts the necessary stability. This design has the advantage of mobility, and therefore permits re-use in marginal fields that would otherwise be uneconomic to develop.

Concrete platforms are usually of the gravity type. In fact, most gravity platforms are built of concrete.

Another variable in the design of offshore platforms is the extent to which they are to be self-contained. At one extreme, the platform may support little more than the drilling rigs, with all other facilities provided by a support vessel tied up alongside. At the other extreme, the platform may accommodate drilling crews quarters, partial processing equipment, waste treatment facilities, and so on, and require only a crew boat to change crews and supply boats to maintain stocks of drilling supplies.

Land for a platform construction yard must be flat (less than 3 percent gradient), have a low water table, and have a high bearing load (approximately 7 tons per square foot). Information available for a facility fabricating nine steel platforms simultaneously indicates that 400 to 800 acres are required, of which 55% would be used for fabrication, and the rest for storage and auxiliary services. Concrete platform construction is less demanding of land, each platform requiring 20 to 50 acres.

About 200 feet of waterfront is needed for each platform under construction. Water depth requirements for steel platforms are 15 to 30 feet, with a channel width of 200 feet. Concrete platforms need deeper water, 35 to 50 feet, and no channel constriction, i.e., the facility must be located on a broad harbor or bay.

Platforms are partially erected on land, and then floated out to the ocean site. The sub-assemblies are very large, and require large clearances in their passage from the yard to the open sea. Steel platforms require both horizontal and vertical clearances between 210 and 350 feet, depending on the particular design. Concrete platforms require 400 feet vertical clearance.

Construction materials for both steel and concrete platforms are required in such quantities that they are best brought to the fabrication yard by barge. For example, each concrete platform needs two or three 3,000 ton barges of aggregate a week, and one barge every two weeks of cement. Barge traffic for a steel platform would probably be less.

Platform installation is required to begin in the fifth year after lease sale. Hence, platform construction would have to start in year four. It would continue to year thirteen.

1.12.2 Supply Requirements

Information available for a yard fabricating nine steel platforms indicates that 100,000 gallons of freshwater will be consumed per day. For the size of work force involved (see below), this would appear to be mostly for personal use. For the same yard, fuel and power would be required, and also steel plate, rod, pipe and structural shape. However, quantities are not known, at this time. Road traffic for such a facility would considerable, as many as 4,000 vehicles per day, including commuting personnel. Approximately 300 railroad cars, mostly of steel products, would be required each year.

Somewhat more information is available for a concrete platform yard. For each platform, an average of 15,000 gallons per day of freshwater would be required for domestic uses and 25,000 gallons per day for concrete mixing. Peak requirements would be 25,000 and 40,000 gallons per day respectively. Connected electrical load would be 3,000 kw. Materials for concrete would be brought in by barge, as stated in Section 1.12.1. Otherwise, three trains would be needed, each day. Road traffic, other than commuters, would be four fuel trucks per week, four trucks per week of spare parts and one of heavy machinery, and 20 trucks per day of supplies.

1.12.3 Employment

For the same level of steel platform fabrication activity (nine at once), the annual average labor needs would be 2,025, with a peak of 3,000. Local hirings could run 80 percent of these. Approximately 50 percent of the total workforce are shipfitters and welders. 20 percent are loftsmen, painters, electricians and machinists. Other construction crafts and helpers total another 10 percent, as do maintenance, warehousing and general support. Supervisory, engineering and administrative personnel account for the remainder.

For the construction of one concrete platform, the annual average labor needs would be 350 to 450, with a peak of 600 to 1,200. As many as 85 to 90 percent can be hired locally. The jobs break down as follows: 22 percent supervision, engineering and administration, 40 percent skilled workers (mostly mechanics and concrete workers), 25 percent unskilled workers (laborers, helpers, etc.) and the rest include security, catering and boat personnel.

1.13 Pipecoating Yard

1.13.1 Land and Waterfront Requirements

Most of the land in a pipecoating yard is taken up with pipe storage. The acreage required for the actual coating processes is comparatively small. Flat land is desirable, with a slope no more than 3 percent. A low water table is also desirable for storage purposes, since it permits a greater height of stockpile.

Pipecoating involves two processes. First a coat of corrosion resistant material is applied. After storage for curing, the coat is tested for integrity, and any small penetrations are patched. Then a coat of concrete is applied to give the mass required to hold the pipe down on the sea bottom.

A permanent yard, coating 300 to 350 miles of pipe per year, would occupy 100 to 150 acres. Of this, 95 acres would be used for pipe storage. Two acres would be required for the testing of the corrosion coat, and about the same for the actual coating operation. A so-called "portable" yard could operate in about 30 acres, but the smaller pipe storage capacity would make the scheduling of shipments more critical.

Coated pipe would be barged out to the pipeline laying locations. Waterfront is needed for the loading and unloading of pipe and concrete materials. 750 feet minimum at dockside would permit the simultaneous handling of two barges. These barges draw only about 10 feet, but aggregate is sometimes shipped in vessels of as much as 30,000 DWT, and these would require 20 to 30 feet water depth.

If pipelaying were going on at one or two locations, 5 to 7 barges would be required to transport the coated pipe, depending on the distance from the yard.

The yard would be in operation from year 8 to year 15 after the lease sale.

1.13.2 Supply Requirements

For the same level of activity (300 to 350 miles per year), a pipecoating yard would use 15,000 gallons per day of fresh water. This would include 3,800 gallons per day for concrete mixing and pipe cooling during the coating operation.

Fuel gas is used for melting the mastic materials used for coating. About 12 to 13 million cubic feet would be required each year. Electricity would be consumed at the rate of 1 million kwh per year.

Twelve tons of wire mesh for reinforcing the concrete will be required each week, as well as 1,200 gallons of metal primer.

If pipe and concrete materials are not brought in by sea, pipe would require one train of 100 cars per week, and concrete materials would require up to 20 trucks per day. Solid waste would be trucked out at the rate of 5 to 10 tons per month.

1.13.3 Employment

A pipecoating yard of the above size would employ an annual average of 71 personnel, and a peak of 121 personnel. Of these, 90 percent could be hired locally. There is a specific production season, running from March through September. This is the period when pipelaying operation will be least often interrupted by the weather. No particular skills are required for most of the workers.

1.14 Miscellaneous Facilities

Boat repair and maintenance yards would not be established specially for servicing an offshore oilfield. However, those which already exist in the area would experience an increase in business over the period in which boating activity is increased. This would be essentially for the first 15 years after lease sale. Thereafter, service boats would be operating mostly for offshore platforms engaged in production and workover. Comparatively few boats would be involved at that time, and they would represent only a small fraction of the overall demand for repair and maintenance work in the area.

District offices, if any, will constitute only a small fraction of the demand for office space in any given area. It is unlikely that office buildings would be constructed specially for this purpose.

2. APPLICATION OF SITING CRITERIA TO NASSAU AND SUFFOLK COUNTIES

2.1 General

A preliminary application of the siting criteria listed in Tables 1 and 2 reveals that there are six sites in the Nassau-Suffolk area that could accommodate some type of onshore facilities that would be needed for outer continental shelf development. Some could accommodate only one or two types of activities while others could accommodate more. The availability of land, depth of water and surrounding land uses are major limitations.

A site at Fort Pond Bay (Figure 1) in the Montauk area of Suffolk County could accommodate five major activities. They are temporary bases supporting exploratory drilling, platform installation and pipe line installation, a permanent base which requires 50 acres, and a pipe coating yard which would need somewhat more.

At the present time, the land around Fort Pond Bay is partially zoned for industrial purposes and is being used for sand mining, an ocean science laboratory and miscellaneous industrial uses. The sand mining area occupies at least 50 acres and lies between Long Island Railroad and the shore. The three temporary bases could easily be located here, and it is possible to assemble additional land to accommodate the permanent uses. There is over 1,000 acres of land to the west of the site that is not used. Adequate buffering could be built into the site if and when residential development were to occur on the land. Direct access to Montauk Point State Boulevard could be acquired to avoid any additional traffic near the business section of Montauk.

Fort Pond Bay faces roughly north into Block Island Sound, much of which has depths greater than 60 feet. Depths greater than 40 feet are found within 200 yards off the east shore of the bay and within 500 yards off the west and south shores. Ample water depth for service boats and supply barges could be had at dockside for relatively little dredging.

The Village of Greenport (Figure 2) in the Town of Southold, Suffolk County, has two waterfront areas that could accommodate the three temporary uses. Railroad access is a possibility at the southwestern parcel. The drawback of this site is that it is not presently zoned for industrial or commercial use. Unused marine commercial and industrial buildings at the northeastern end of the harbor could be removed or converted to accommodate the uses. Greenport also has boat repair facilities that might accommodate the large boats that would be required for O.C.S. exploration.

The main shipping lane running between Greenport and Shelter Island has a minimum depth of 33 feet, and most of it is deeper than 50 feet. The 20 foot depth contour runs within 220 yards of the southwest site, and within 450 yards of the northeast one. In the boat repair area of the harbor, 20 feet of water is available even closer in. So that, dredging of access channels does not appear to be a problem in this location.

A site on the west side of the harbor in the Village of Port Jefferson (Figure 3) in the Town of Brookhaven, Suffolk County, is usable as a temporary base supporting exploratory drilling. There is an oil terminal site that is being phased out and approximately 5 acres could be obtained in this deep water harbor that has protection from storms and has adequate turning room for large boats. The major drawbacks of Port Jefferson are its distance from the proposed drilling sites and the possible conflict with recreational boating activities in the harbor. However, 35 feet of water depth is already available at the existing dock, and a channel 25 feet deep and 300 feet wide extends the full length of the harbor and out into Long Island Sound.

The industrial area in the Village of Freeport (Figure 4) in the Town of Hempstead, Nassau County, could provide a temporary base supporting exploratory drilling. The area could also be used for boat repair since facilities of this type already exist in an area that might have enough depth for large boats. A few of the uses in the industrial area could be phased out in the future so there is an outside possibility of assembling enough land for a permanent base. The village sewer plant, incinerator and public works storage area are the uses that could be replaced by the use of county facilities or could be at a non-waterfront location. The only municipal use that cannot be relocated is the new village power plant.

Sea access is by Jones Inlet, either side of Meadow Island, the Bay of Fundy, the west side of Pettit North, and Freeport Creek, a distance of about 11 miles. Depths along this route are mostly between 10 and 17 feet, with some spots of less than 10 feet. Considerable dredging would be necessary to provide 15 feet minimum throughout. However, the area is highly industrial, and the access that the channel would provide to boat repair yards might make it economical.

A site adjacent to the oil terminals in Oceanside (Figure 5) in the Town of Hempstead, Nassau County, can be used as a temporary base supporting exploratory drilling. A 5 acre site could be assembled by combining the vacant land and abandoned buildings along the channel that leads into East Rockaway. There are two large tracts of industrially zoned land in the Oceanside area that have good highway access and are surrounded almost entirely by non-residential uses. However, they do not have direct access to major channels since they are blocked by low bridges on the Long Island Railroad and Long Beach Road.

Sea access is by East Rockaway Inlet, Reynolds Channel, and Hog Island Channel, a total distance of about 16 miles. Most of the route is deeper than 20 feet, in places considerably deeper. However, there are some stretches shallower than 20 feet, and a few places as shallow as 11 or 12 feet. Dredging would probably not be a serious problem if the site itself was considered advantageous, and the distance to the ocean was not a drawback.

A site in the Yaphank-Shirley area (Figure 6) in the Town of Brookhaven, Suffolk County, appears to be the best possibility for locating a gas treatment plant. At the present ime, there are two large sites east and west of William Floyd Parkway that are between the Long Island Railroad main line and the Long Island Expressway. The westerly site has 118 acres and the easterly site 215 acres. There is an office building on William Floyd Parkway and model homes which are temporarily occupying part of the land, along with an access road for a proposed industrial park on the 215 acre site. The interior of this parcel could accommodate a gas treatment plant on approximately 100 acres. Non-Residential uses such as the Brookhaven Laboratory, a race track, and a proposed shopping center, are on the other side of the expressway. Vehicular access to this site is as good as any location on Long Island. In addition, a connection could be made to the gas pipe line system that could serve all parts of Long Island.

In order to connect a pipe line from this site to a site on the continental shelf, a direct line to the south would be necessary. This is possible if the median strip of county-owned William Floyd Parkway is used. The road extends past this site almost to the Atlantic Ocean (Figure 7). At the ocean is a parking area that is part of the Smith Point County Park and it would be possible to place a line underneath the parking lot. There are bridges over the Long Island Railroad main line, Sunrise Highway, and Narrow Bay (between the Park and Fire Island). In addition, there is a proposed additional railroad bridge over the Montauk branch. The pipe line could be carried on the bridges or tunneled underneath the roadways and railroad crossings.

The ocean bottom at this point slopes 30 feet in about 1000 yards, the beach itself is gently sloping and the dunes are minimal.

Each type of onshore facility, and its possible locations in Nassau-Suffolk, if any, is discussed below, in further detail.

2.2 Temporary Base Supporting Exploratory Drilling

Possible sites can be identified at the following five locations:

Fort Pond Bay	(Figure 1)
Greenport	(Figure 2)
Port Jefferson	(Figure 3)
Freeport	(Figure 4)
Oceanside	(Figure 5)

The sand mine at Fort Pond Bay is still in operation. However, much of it has been mined out, and land could probably be made readily available for a base to service several rigs. In the Village of Greenport, the two possible sites are each only big enough to service one, or possibly two rigs. There would be delays for securing permits, and clearing existing structures. In addition, it might be difficult to provide the length of dockside needed. Port Jefferson offers the potential for a one or two rig service base, with an existing dock and no water depth restrictions. However, oil tanks would have to be removed, and local authority permission obtained. The two Nassau County sites, Freeport and Oceanside, are most attractive from the point of view of their locations in areas already highly industrialized and their ready availability. However, their distances from open water, and the need for substantial channel dredging are problems.

In view of the timing discussed in Section 1.2, the likeliest condidate is Fort Pond Bay.

Freshwater and electricity will have to be supplied locally. The quantity of electricity is difficult to estimate. It would be required only for the normal housekeeping needs of the base, a relatively small amount. However, the water is required for the offshore drilling, and amounts to 4,740,000 gallons per year of non-potable and 460,000 gallons per year of potable water per rig. This would be for a rig drilling four wells, each 15,000 feet deep, per year. Oil fuel and operating materials will be brought in from elsewhere, by rail and truck.

2.3 Temporary Base Supporting Platform Installation

The following two sites are possible:

Fort Pond Bay (Figure 1)
Greenport (Figure 2)

These are the only sites which provide sufficient open water for maneuvering the large vessels that are employed in platform installation. As mentioned previously, the Greenport sites might not be able to accommodate the necessary length of dockside, although this is no problem at Fort Pond Bay. In any event, bases for platform installation would not be needed until the 5th year after the lease sale, and there would be time to construct the necessary wharfage.

Greenport might present a further complication, because of the possible interference of the additional vessel traffic with regular harbor operations, especially if concrete platforms are involved. This would present no problem at Fort Pond Bay.

Water and electricity will be required, but only in normal base housekeeping amounts.

2.4 Temporary Base Supporting Pipeline Laying

The same two locations, Fort Pond Bay and Greenport, could possibly serve for pipeline laying support. Similar reservations can be stated as for platform installation, except that the additional boat traffic would probably not be as heavy as for (concrete) platform installation, and the pipeline base would not be needed until about 7 years after the lease sale.

2.5 Permanent Base

The only definite candidate for the location of a service base is Fort Pond Bay (Figure 1), in view of the sand mine acreage available, and the possibility that operations could be phased out in the 3 years after the lease sale. Water depth and sea access are little or no problem. Another possibility is Freeport (Figure 4), if a sufficiently large parcel of land can be accumulated.

As mentioned previously, the Freeport site suffers from its distance from the ocean, and the need to dredge the channel. However, road and rail access into this industrial area is very good. On the other hand, the Fort Pond Bay site could very well be supplied by sea.

Power requirements are for housekeeping purposes only. Freshwater would have to be supplied to the offshore platform(s) in the following amounts:

a. For each platform engaged in development drilling (i.e., approximately from the 6th to the 13th year after the lease sale), having 2 rigs, and drilling 8 wells per year, each 15,000 feet deep.

Non-potable	7,740,000 gal./yr.
Potable	460,000 gal./yr.

b. Production (6th to 31st year after lease sale) - housekeeping requirement only, i.e. about 100 gallons per capita day.

c. Workover (14th to 29th year after lease sale) - 520,000 gallons total for each well worked over.

2.6 Pipeline Landfall

Both oil and gas could be pipelined ashore. In the case of oil, there appears to be little justification for bringing a pipeline ashore to Nassau-Suffolk. Such a pipeline would either be run overland to a refinery, or connected to a marine terminal. For reasons presented later, neither of these is a likely possibility. On the other hand, gas is in short supply on Long Island, and a gas pipeline could be justified.

The location of the landfall must be determined by the location of the gas treatment plant it would be connected to. This consideration leads to a landfall site on the Fire Island shore at Smith Point Park, Shirley (Figure 7). As mentioned previously, the local topography is highly favorable, and, if experience elsewhere is repeated here, it should be possible to restore the excavated area to its pristine appearance. The pipeline itself requires minimal maintenance.

2.7 Marine Terminal

A marine terminal would be employed either to receive oil from the offshore field by tanker and deliver it by overland pipeline to a refinery, or to receive oil by pipeline, store it, and load it into tankers for shipment elsewhere.

In neither case is a Long Island location reasonable. For one thing, there is no refinery here, nor is there likely to be one (see below). For another, there are existing oil unloading and storage facilities in nearby north New Jersey, and an entirely new facility in the area is highly unlikely to receive acceptance.

From the point of view of supplying Nassau-Suffolk with oil products, apart altogether from OCS oil development, existing and proposed facilities are expected to suffice.

2.8 Partial Processing Plant

The judgment has already been made (Section 2.6) that an oil pipeline to Nassau-Suffolk is unlikely to materialize, and consequently, a partial processing plant to treat oil is equally unlikely to be located on shore.

A gas pipeline to shore is much more likely, and, in this case, partial processing is much less complex, and would probably be carried out on the platform. If located on shore, the plant would be integrated into the gas treatment plant.

2.9 Gas Treatment Plant

The Yaphank industrial zoned area (Figure 6) appears to be the best location for this facility. Land is available in sufficient amount, in an area set aside for an industrial park. Of the 75 acres estimated to be required for a plant sized to handle 1 billion cubic feet per day, only 20 acres are occupied by processing equipment. The rest, which includes open storage and parking, acts as a buffer around the plant proper.

In addition, the adjacent William Floyd Parkway provides a convenient pipeline route from a good landfall site at Shirley.

However, power and water requirements will be substantial. Power consumption for a plant of this size is 5,400,000 kwh per month, equivalent to an average connected load of 7,500 kw, for 24 hours a day, 30 days a month. Water consumption is 200,000 gpd.

2.10 Oil Refinery

For a capacity of 250,000 bbl/day, an oil refinery would occupy about 1000 acres. Smaller capacities would still be economical to build (some quite new units are as small as 50,000 bbl/day in capacity), but the savings in acreage would not be commensurate. In addition, the environmental impacts, both in construction and in operation, will be considerable. There is not a large enough piece of land available in the industrially zoned areas of Nassau-Suffolk, and it is highly unlikely that permission would be given for a refinery to be built in a non-industrial area.

2.11 Petrochemical Plant

In the absence of an oil refinery, the only feedstocks available for a petrochemical industry would come from the gas treatment plant. These are the hydrocarbon gases and liquids separated out of the natural gas, namely ethane, propanes, butanes, ethylene, propylenes and butylenes. It is not known at this time exactly how big these fractions will be. The propanes and butanes would be utilized in LPG, and bottled and possibly distributed for local sale. The other components could be used in the manufacture of polyethylene, polypropylene, etc. However, failing any information on quantity, it is fair to assume that all could be condensed, bottled, and shipped elsewhere for processing. These facilities would all be incorporated in the gas treatment plant. It goes without saying that these operations are hazardous.

2.12 Platform Fabrication Yard

There is no waterfront location at which the more than 400 acres required for steel platform fabrication could be found. Concrete platforms could possibly be built at the Fort Pond Bay site. However, fairly deep water (35 feet minimum) would be required, not in a single channel, but on a fairly wide frontage (200 feet). This would be for building one concrete platform at a time. Two platforms would require deep water on 400 feet frontage, and so on.

It appears infeasible to build platforms in this area.

2.13 Pipecoating Yard

So-called "permanent" yards require 100 acres, minimum, whereas "portable" yards occupy only 30 acres. The difference, presumably, is whether the yard is set up for constructing pipelines for just one offshore field, or whether it is conveniently located to serve a wider region.

The Fort Pond Bay site (Figure 1) could accommodate a "portable" yard comfortably, but a "permanent" yard would be a tight squeeze. The water depth and frontage requirements, however, are readily available.

Water and energy requirements would be fairly modest. For a yard coating 300-350 miles of pipe per year, 1 million kwh and 12-13 million cubic feet of natural gas would be consumed per year. Water would be consumed at the rate of 15,000 gpd, which includes 3,800 gpd for mixing concrete and cooling the pipe in the coating process.

2.14 Miscellaneous Facilities

Boat repair and maintenance facilities exist in Greenport and Freeport (Figures 2 and 4). Water depth is adequate in Greenport with the minimum of dredging, but large sections of the channel to the Freeport location would need to be deepened.

Facilities of this type exist in several of the small harbors in Great South Bay. However, the amount of dredging that would be required to provide 15 to 20 feet of water up to any one of them is prohibitive.

It is considered unlikely that entirely new facilities of this type would be built to meet the demands of offshore development. What is more likely is that existing yards would expand their activities in response to demand. Water, power, and supplies of all kinds will be required, but, at this time, it is not possible to estimate the quantities.

The category of district office is included here, because the literature refers to it. However, with Nassau-Suffolk being so close to New York City, it appears unlikely that an oil company would set up a branch office here. In any event, office space is fairly readily available in the bi-county region.

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TABLE 1

Land and Waterfront Requirements for Onshore Facilities
For OCS Oil Development Support

Sheet 1 of 3

Facility	Life time*	Land Area	Water-Front Length	Water Depth	Boat Traffic
1. Temporary Base, Supporting Exploratory Drilling	1st-5th	0.5 acre per rig - warehousing 1.0 acre per rig - open storage 1.0 acre per rig - helipad Parking. Total: 5 acres per rig.	200' per rig (500' for 3 rigs)	15' to 20' minimum all-weather access.	2 or 3 supply boats and one crew boat per rig. Economies when more than one rig. Also, more round trips per boat when distance to offshore point is less. Thus, for 3 rigs:- 200 mi. offshore - 8 or 9 supply boats. 100 mi. offshore - 4 or 5 supply boats.
2. Temporary Base, Supporting Platform installation	5th-13th	5 acres for installing up to 4 platforms per year. Mostly open storage. Includes 1 acre helipad & 10,000 sq. ft. of office & communications space.	200' min., plus 200' for each "spread" of construction & supply vessels.	15' to 20' minimum maneuvering area 5 times width of largest vessel, e.g. derrick barge.	1 supply boat and 1 crew boat for each steel platform being installed. Several barges (e.g., cargo, derrick, etc.), but mostly offshore, with little impact on shore facilities. For each concrete platform, 3 or 4 400 ton barges & 6 workboats with frequent visits dockside.
3. Temporary Base, Supporting the laying of a pipeline.	7th-15th	5 acres, including both covered warehousing & open storage. (The pipe itself is not stored here, but goes direct from pipecoating yard to offshore site.) Also includes 1 acre helipad & 10,000 sq. ft. of office & communications space.	As previous.	As previous.	1 supply boat & 1 crew boat for each lay barge operating. Also several other barges (e.g., cargo, jet, etc.) & tugs, but mostly offshore, with little impact on shore facilities.
4. Permanent Base, Supporting Development Drilling, & Production. (High Find Scenario)	3rd-31st Dev. 6th-13th Prod. 6th-31st Wkover. 14th-29th	50 to 70 acres, depending on offshore activity. Mostly warehouses open storage, plus 10,000 sq. ft. of office & communications space & 1 acre per platform for helipads.	200' per rig or platform. (600' for 4)	15' to 20' minimum all-weather access.	During development drilling, 4 supply boats & 1 crew boat per platform. (15 supply boats for 5 platforms.) During production & "workover", 1 supply boat for 2 platforms, & no crew boat.

TABLE 1 (cont'd.)

Land and Waterfront Requirements for Onshore Facilities
For OCS Oil Development Support

Facility	Life-time*	Land Area	Water-front Length	Water Depth	Boat Traffic
5. Pipeline Landfall	Instal-lation 7th-9th Oper-ation 9th-31st	50' to 100' right-of-way. 40 acres for (oil) pumping station, if required (200,000 bbl/day capacity). 60 acres for terminal, if required.	up to 100'	Gently sloping approach, with sand or shingle to give not less than 10' of cover down to MLW, and 7' of cover out to 50' water depth. Preferably, gentle transition from beach to land, but cliffs up to 100' acceptable, if rock is soft.	
6. Marine Terminal (shoreside, fixed pier.)	13th-31st	Much of the terminal area required for tank farm, e.g. 17 acres for 1 million bbls. capacity. 50 acres for 3 million bbls. capacity. Up to 40 more acres for equipment, buildings, services. Open space & buffer zone additional.	1000' for 40,000 DWT Tanker	40' minimum for 40,000 DWT Tanker. More in the channel & maneuvering area. The latter's diameter is twice ship's length when tugs used, & four times when not.	EIS for Georges Bank lease sale states 1 Tanker of 40,000 DWT sufficient to transport total production.
7. Partial Processing Plant	5th-31st	15 acres per 100,000 bbl. of oil processed per day.	-	-	(Sometimes, all or part of the processing equipment located on the offshore platform. Sometimes, plant located at the marine terminal or gas processing unit.)
8. Gas Treatment Plant	10th-28th	For capacity of 1 billion cu. ft/day, 75 acres, of which 20 acres are building & structures. For 200 million cu. ft/day, 50 acres, approx.	-	-	-
9. Oil Refinery	Con-struc-tion 5th-8th Opera-tion 9th-31st	For capacity of 250,000 bbls/day, 1000 acres, of which 200 acres are processing units & 400 acres are building & storage.	-	-	-
10. Petrochemical Plant	-	X	-	-	-

TABLE 1 (cont'd.)

Land and Waterfront Requirements for Onshore Facilities
For OCS Oil Development Support

Facility	Life time*	Land Area	Water-front Length	Water Depth	Boat Traffic
11. Platform Fabrication Yard	4th-13th				
a. Steel Platforms (9 constructed at a time.)		400-800 acres, 55% for fabrication, 45% for storage and support. Flat land (less than 3% gradient), with low water table and high bearing load (approx. 7 tons/sq. ft.). Waterfront required, cleared, but without existing buildings or docks.	Approx. 200' for each plat-	15' to 30' with min. channel width of 200'.	Sea access requires 210' to 350' horizontal & vertical clearance. Materials most economically brought in by barge.
b. Concrete Platforms (One constructed at a time.)		20-50 acres per platform.	As previous	35' to 50', with no channel to be navigated.	400' vertical clearance. For each concrete platform, 2 or 3 3000 ton barges per week of aggregate, 1 barge every 2 weeks of cement.
12. Pipecoating Yard	8-15	100-150 acres for a "permanent" yard. (30 acres for a "portable" one.) 95 acres of storage, 2 acres for testing coating. Flat land (less than 3% gradient). Low water table, if high, stockpile height must be less, and storage area greater.	750' minimum to load 2 supply barges at once.	20' to 30', for the 30,000 ton vessels bringing aggregate. 10' min. for the supply barges.	5 to 7 supply barges for 1 or 2 lay barges operating.
13. Repair & Maintenance Yard	These services will be based on existing facilities in the area, which may expand in response to increased demand.				
14. District Office			-	-	-

Legend
* Years after lease sale (NERBC high find scenario)
X Quantity unknown

IW 1/13/77

TABLE 2

Supply Requirements of Onshore Facilities
For OCS Oil Development Support

Facility	Fresh Water	Fuel For Transport^{n}	Fuel For Operation	Mud, Cement Chemicals	Steel & Tubular Goods	Misc.	Elec. Power	Traffic
1. Temporary Base, supporting exploratory drilling (based on 4 wells per year per rig, 15,000 ft. deep.)	460,000 gall/yr potable. 4,740,000 gall/yr other	12,800 bbl. oil per rig per year.	13,272 bbl. oil per rig per year	3,828 tons per rig per year.	1,820 tons per rig per year of pipe	Food, tools & parts	X	Helicopter transport of food, tools, etc., off-shore. Also operating crews in bad weather. Road & rail movements of materials & supplies.
2. Temporary Base, supporting platform installation.	X	X	-	-	-	Food, tools & parts	X	As for 1.
3. Temporary base, supporting pipeline laying.	X	X	50,000 gall/mo. for lay barge. 180,000 gall/mo. for jet barge.	-	-	Food, tools & parts	X	As for 1.
4. Permanent Base, supporting development drilling & production.								
a. drilling (per platform, having 2 rigs, drilling 8 wells per year)	460,000 gall/yr. potable. 7,740,000 gall/yr other	25,000 bbl. per year.	28,560 bbl. oil per year.	6,488 tons per year	3,816 tons per yr. of pipe	Food, tools & parts	X	As for 1.
b. production	X	19,200 bbl. oil/year, total		-	-	"	X	As for 1.
c. workover	520,000 gall/well		2,000 bbl/well	66 tons/well	2 tons pipe/well	"	X	As for 1.

TABLE 2 (cont'd.)

Supply Requirements of Onshore Facilities
For OCS Oil Development Support

Facility	Fresh Water	Fuel For Transport[n]	Fuel For Operation	Mud, Cement Chemicals	Steel & Tubular Goods	Misc.	Elec. Power	Traffic
5. Pipeline Landfall	-	-	-	-	-	-	-	-
6. Marine Terminal (Shoreside, Fixed Pier)	X	12,200 bbl. oil per year.	-	-	-	Tools & parts	8 million kwh per year for 1 million bbl. storage. 14 million kwh pr. year for 2 million bbl. storage. 850,000 kwh pr. yr. for other services.	Road & rail movements of supplies.
7. Partial Processing Plant (Capacity 30,000 bbl. oil per day.)	10,000 galls per month.	X	1.5 million cu. ft./day gas.	-	-	Tools & parts	400,000 kwh/mo. Peak load 700 kw.	Feed by pipeline. Oil and gas out by pipeline. Natural gas liquids out by tank truck.
8. Gas Treatment Plant (Based on plant capacity of 1 billion cu. ft./day.)	200,000 GPD	-	360 million cu.ft./month gas.	-	-	Tools & parts	5,400,000 kwh per mo. (average load 7,500 kw)	Road & rail movement of LPG product & operating supplies. Gas products pipelined out, unless NG liquefied.

TABLE 2 (cont'd.)

Supply Requirements of Onshore Facilities
For OCS Oil Development Support

Facility	Fresh Water	Fuel for Transport^n	Fuel for Operation	Mud, Cement Chemicals	Steel & Tubular Goods	Misc.	Elec. Power	Traffic
9. Oil Refinery (Based on plant capacity of 250,000 bbl/day of feed-stock with low heavy fraction)	13.2 MGD of which 5.4 MGD are consumed, primarily by evaporation.	-	24,330 bbl. oil/day	-	-	Tools & parts	1,818,000 kwh per day. Total load 100,000 kw.	Products shipped by road, rail & pipeline. Operating supplies brought in by road & rail.
10. Petrochemical Plant	X	-	X	-	-	X	X	Products shipped by road & rail. Feedstock in by pipeline. Operating sup-plies in by road & rail.
11. Platform fabrication yard a. Steel platforms (9 platforms construc-ted at a time)	0.1 MGD (1500 workers)	X	X	-	Steel plate girders & pipe.	Tools & parts	X	Total of 4000 vehicles per day, including commuting personnel & supplies. 300 rail cars per year.
b. Concrete platforms (1 platform con-structed at a time.)	15,000 GPD avg. for do-mestic uses, 25,000 GPD avg. for concrete (25,000 and 40,000 at peak, resply.)	X	X	-	Reinforc-ing steel.	Aggregate cement sand tools & parts	3,000 kw	Commuting personnel by car 4 fuel trucks per week 1 truck per week for heavy machinery 4 trucks per week for spare parts 20 trucks per day for sup-plies 3 trains per day for raw materials, if not by barge.

TABLE 2 (cont'd.)

Supply Requirements of Onshore Facilities
For OCS Oil Development Support

Facility	Fresh Water	Fuel for Transport[n]	Fuel for Operation	Mud, Cement Chemicals	Steel & Tubular Goods	Misc.	Elec. Power	Traffic
12. Pipecoating yard	15,000 GPD including 3,800 GPD for concrete, pipe cooling, etc.	X	12-13 million cu.ft./yr., natural gas.	-	Steel pipe 300-350 miles per year.	Primer up to 1,200 gall/week. Wire mesh for reinforcement 12 tons/week. Coating material.	1 million kwh per year.	One 100-car train per week for pipe. Up to 20 trucks per day of concrete materials for coating 40 inch pipe. Automobiles for up to 200 personnel. Trucks for solid waste - 5-10 tons per month.
13. Repair and maintenance yard.	X	X	X	-	X	X	X	Personnel automobiles & trucks for parts and supplies.
14. District Office	X	-	X	-	-	-	X	Personnel automobiles

TABLE 3

Employment in Onshore Facilities for OCS Oil Development Support

Facility	Average Annual		Peak	
	Local	"Imported"	Local	"Imported"
1. Temporary Base for Explor. Drilling No. per rig.	33	12	33	12
[Offshore	45	77	45	77
2. Temporary Base for Platform Inst. *	59	27	85	33
[Offshore	261	782	340	1020
3. Temporary Base for Pipeline laying **	25	11	40	21
[Offshore	108	432	185	738
4. Permanent Base - Per platform, development drilling	39	14	86	30
5a. Pipeline Landfall - Construction	40	10	40	10
5b. Pumping Station Construction				
Operation	13	4	13	4
6. Marine Terminal - Construction	113	452	113	452
Operation	25	10	25	10
7. Partial Proc. Plant Construction	150		150	
Operation	10		10	

TABLE 3 (cont'd.)

Employment in Onshore Facilities for OCS Oil Development Support

Facility	Average Annual		Peak	
	Local	"Imported"	Local	"Imported"
8. Gas Treatment Plant - ***				
Construction	150	150	275	275
Operation	30	20	30	20
9. Oil Refinery -				
Construction	1526	654	1600	400
Operation	374	61	287	123
10. Petrochemical Plant				
11. Platform Fab. Yard				
a. Steel platforms, 9 at a time, approx.	1620	405	2400	600
b. Concrete platforms, one at a time.	350-450		600-1200	
12. Pipecoating Yard **	64	7	109	12

* Four steel platforms, simultaneously.

** 300 to 350 miles of pipeline laid per year.

*** One billion cubic feet/day capacity.

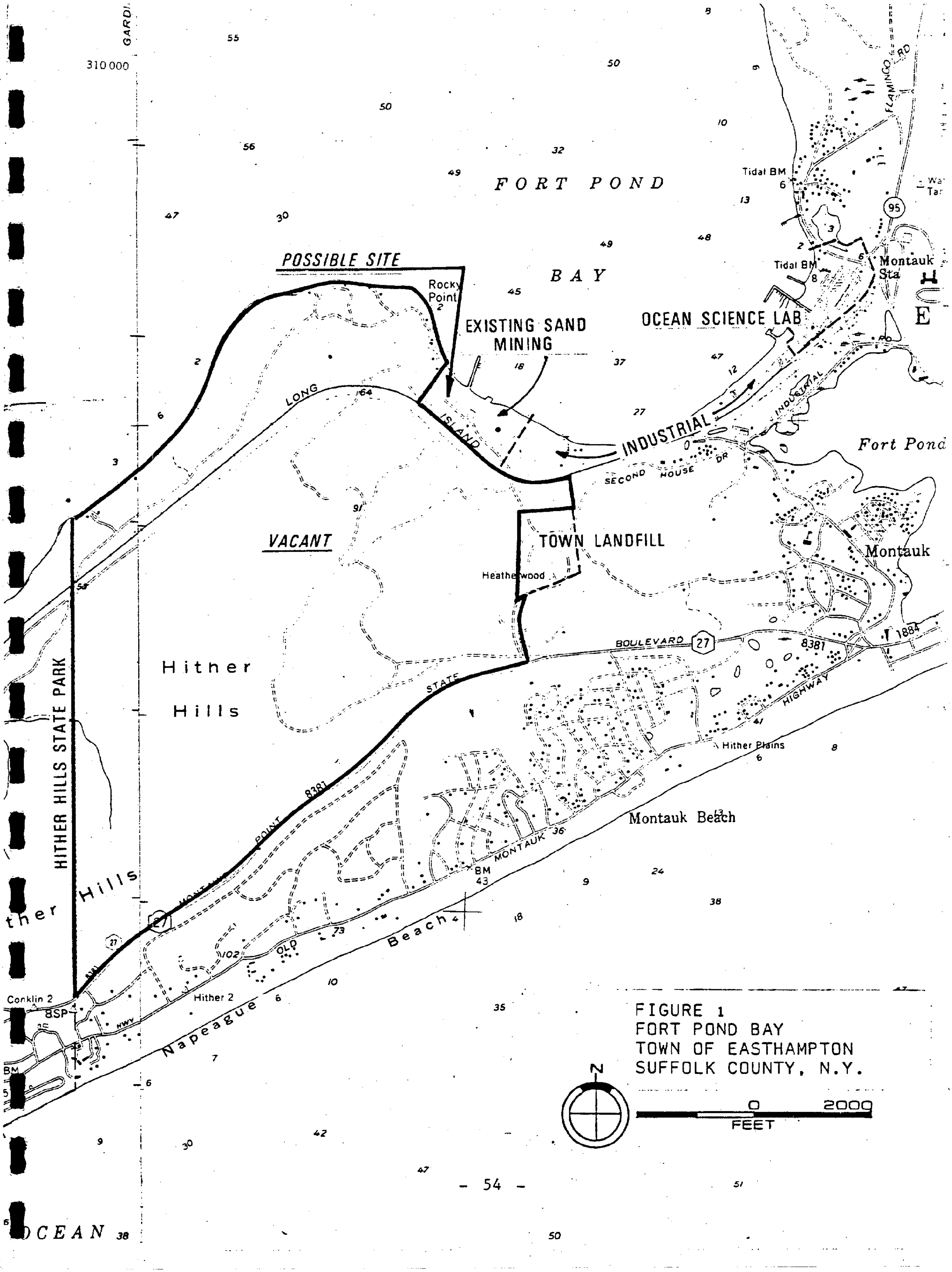

FIGURE 1
FORT POND BAY
TOWN OF EASTHAMPTON
SUFFOLK COUNTY, N.Y.

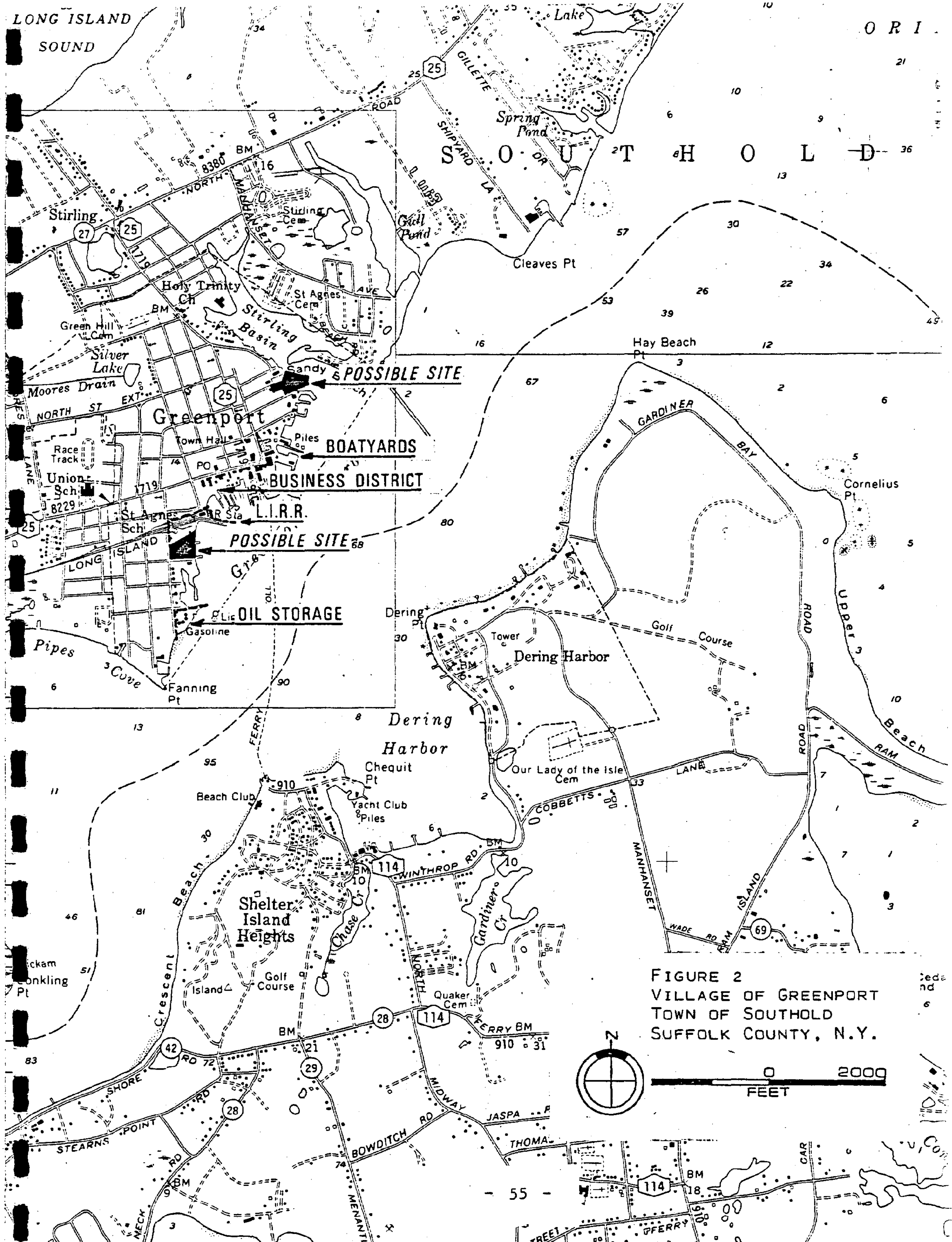

FIGURE 2
VILLAGE OF GREENPORT
TOWN OF SOUTHOLD
SUFFOLK COUNTY, N.Y.

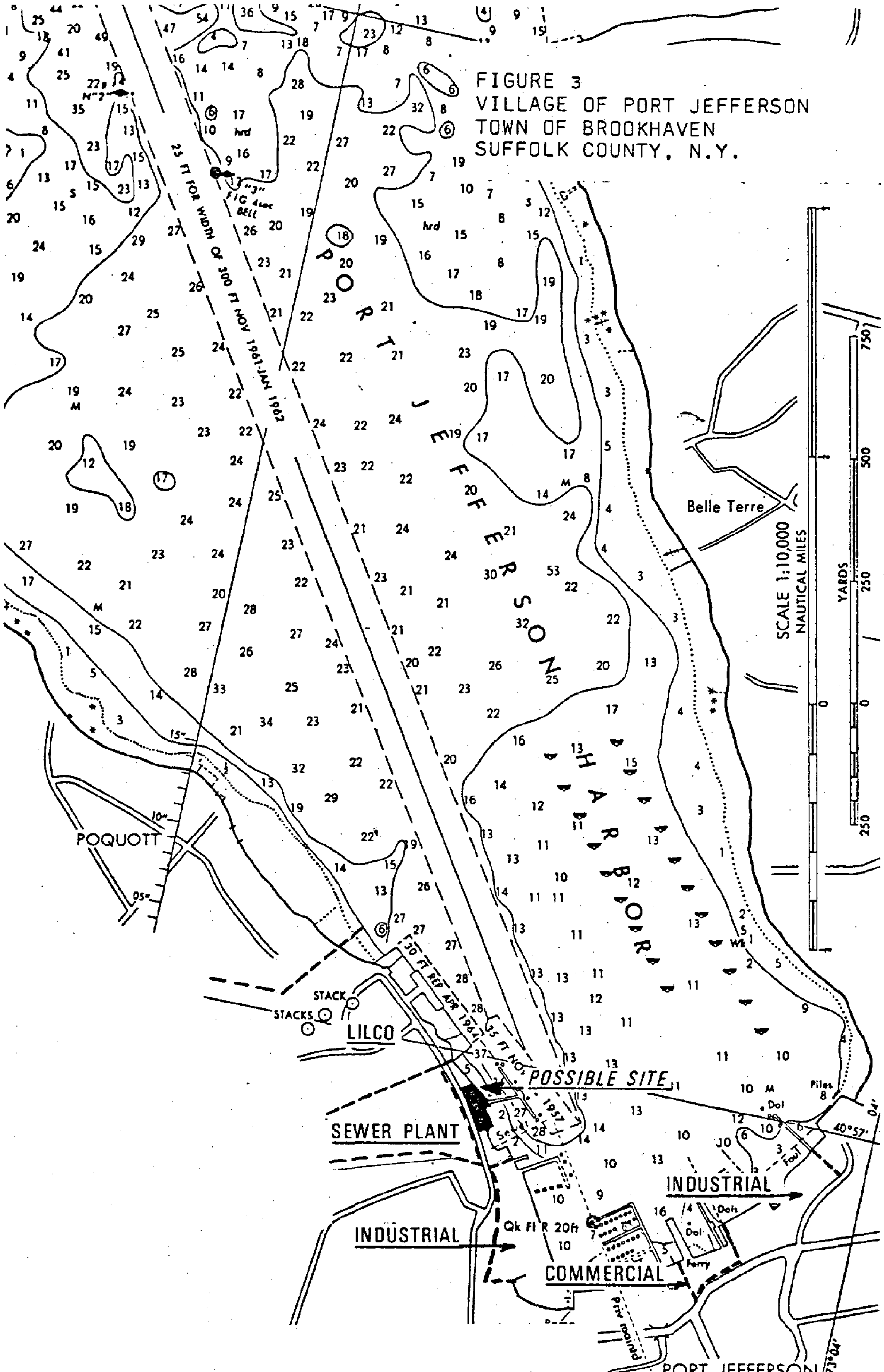
FIGURE 3
VILLAGE OF PORT JEFFERSON
TOWN OF BROOKHAVEN
SUFFOLK COUNTY, N.Y.
25 FT FOR WIDTH OF 300 FT NOV 1961-JAN 1962
PORT JEFFERSON
HARBOR
Belle Terre
SCALE 1:10,000
NAUTICAL MILES
YARDS
POQUOTT
STACK
STACKS
LILCO
30 FT REP APR 1964
35 FT NOV 1957
POSSIBLE SITE
SEWER PLANT
INDUSTRIAL
INDUSTRIAL
Qk Fl R 20ft
COMMERCIAL
Ferry
Priv roadway
PORT JEFFERSON


AUTO RACING STADIUM
INDUSTRIAL
VACANT
BOATYARD storage & repair
VILLAGE
DPW
incinerator
parking
STATE boat launching facility
sewer plant
power plant
POSSIBLE SITE
FIGURE 4
VILLAGE OF FREEPORT
TOWN OF HEMPSTEAD
NASSAU COUNTY, N.Y.
N
FEET
FREEPORT
Merrick
Merrick Bay
Baldwin Bay
Fighting Island
Point Lookout
Hempstead Town Park
JONES INLET
JONES BEACH STATE
West End
Bay of Fundy

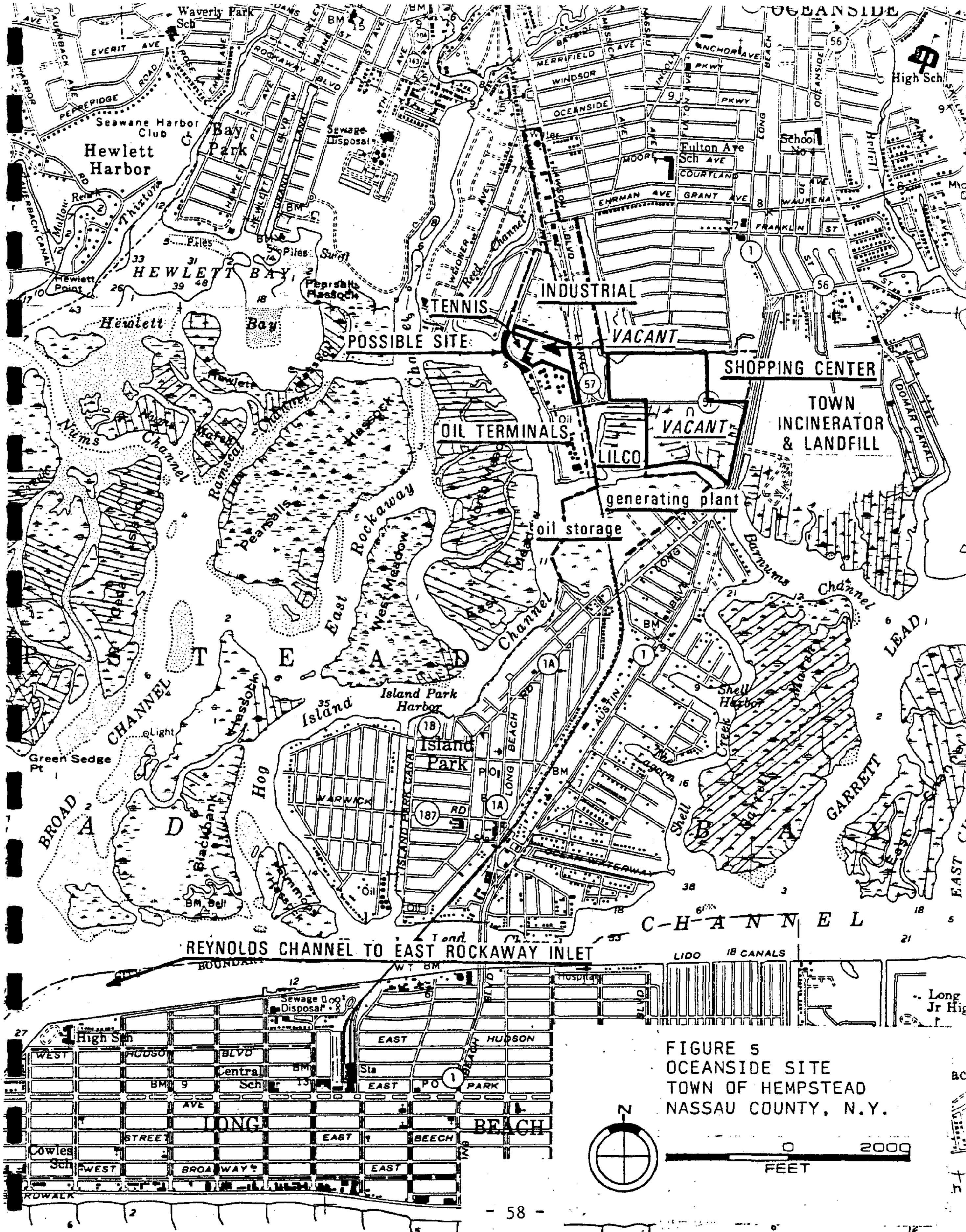

FIGURE 5
OCEANSIDE SITE
TOWN OF HEMPSTEAD
NASSAU COUNTY, N.Y.

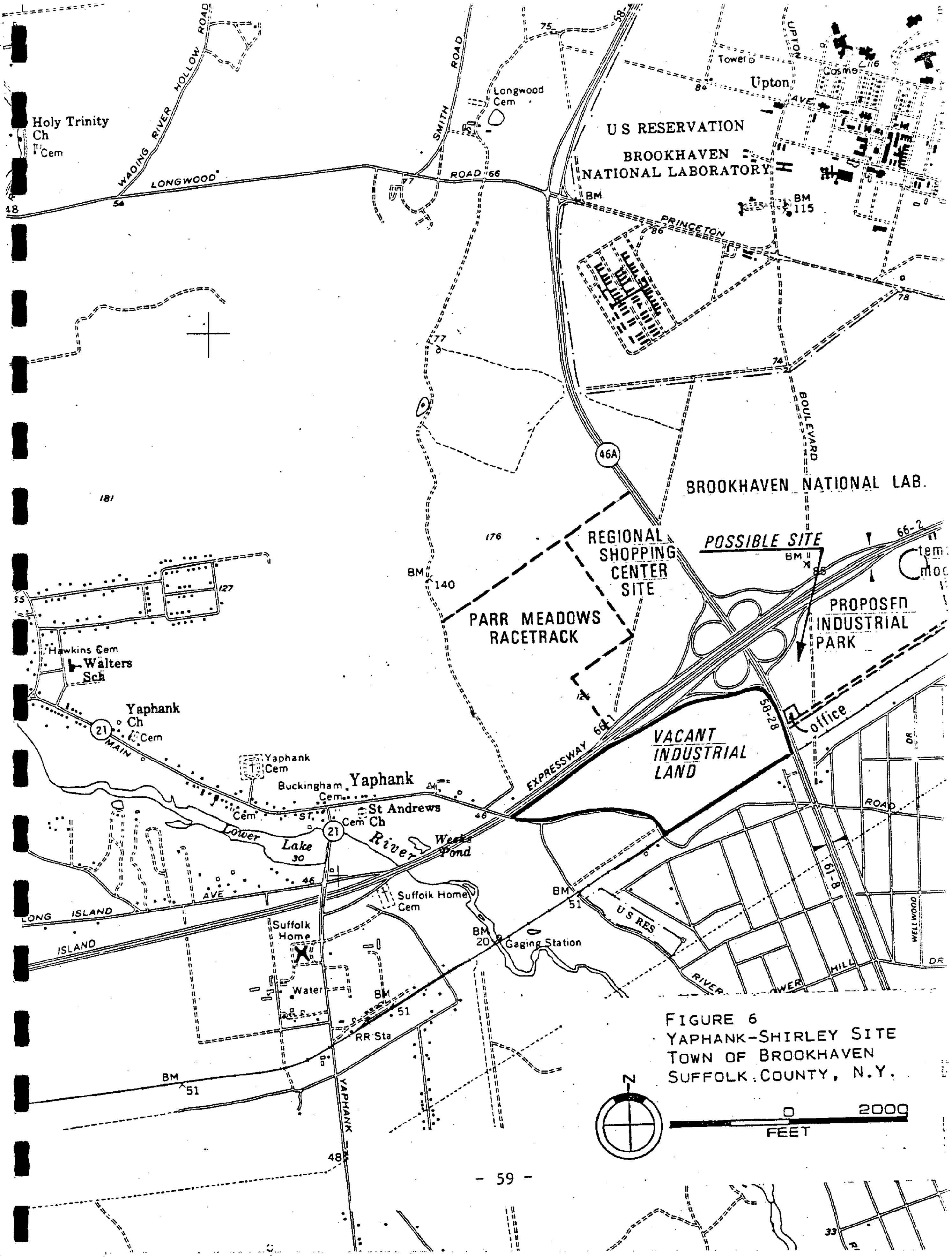

FIGURE 6
YAPHANK-SHIRLEY SITE
TOWN OF BROOKHAVEN
SUFFOLK COUNTY, N.Y.

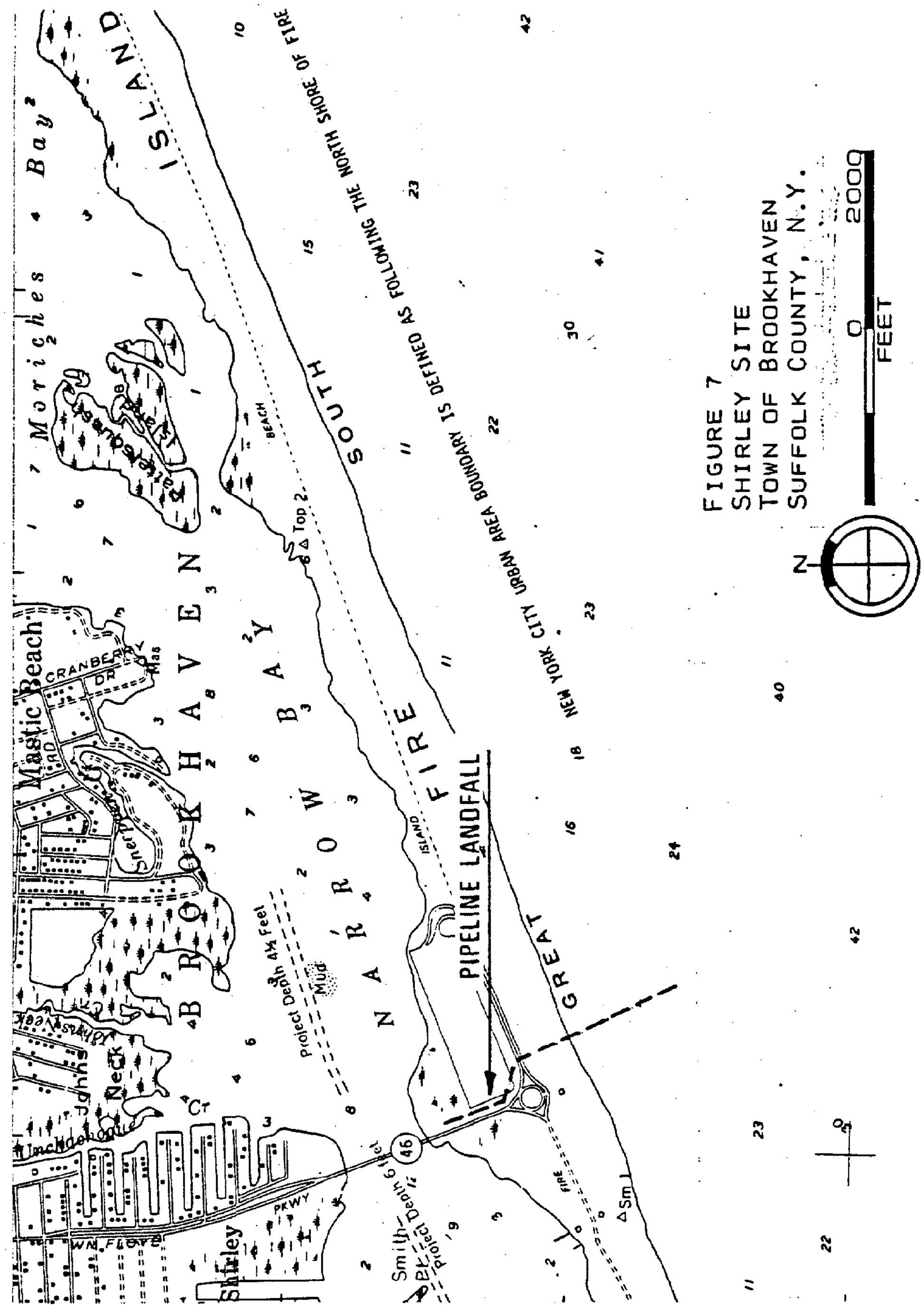

FIGURE 7
SHIRLEY SITE
TOWN OF BROOKHAVEN
SUFFOLK COUNTY, N.Y.

GLOSSARY

Barge, derrick.

A barge carrying a crane. Used in the installation of offshore platforms, and in the transfer of materials and pipe from supply barges to lay barges.

Barge, jet.

A barge which precedes the lay barge, and excavates the trench in which the pipeline is laid. The trench is formed by using high-pressure jets to dislodge and displace sea-bottom sediments along the pipeline route.

Barge, lay.

The barge on which lengths of the coated pipe are welded end to end, to form a continuous pipeline, which is carried over the stern, on special rollers. The pipeline sinks down to the sea-bottom, as the lay barge is drawn ahead by tugs, and settles into the trench formed by the jet barge.

Catalytic cracker

The piece of equipment in an oil refinery, in which some of the heavier fractions of the crude oil are "cracked", i.e., broken down into lighter products, particularly gasoline.

Coating integrity.

The uniformity of the pipeline coating, that guarantees its ability to resist corrosion by the seawater.

Coating penetration.

A discontinuity in the pipeline coating, which, if not patched, would permit contact between the seawater and the steel of the pipe.

Deadweight tonnage (DWT).

A measure of the size of a vessel, being the weight of water displaced by its hull.

Development.

The period during which wells are drilled in an oilfield for the purpose of establishing production. The potential productivity of the field will already have been determined by exploratory drilling.

Electrical load average.

Electrical energy is measured in units of kilowatt-hours. The "load", or "power", is the energy used per unit time, i.e., kilowatt-hours/hour, or kilowatts. Thus, the average load is computed by dividing the energy consumed in a given period by the number of hours in the period. During the period, there will be times at which the instantaneous load will be greater than the average, i.e., there will be peaks.

Electrical load, connected.

An electric motor must be big enough to handle not only the average load, but also the peak loads. The nominal motor power (horsepower or kilowattage) is the connected load. The sum of all nominal motor powers in a plant is the total connected load.

Electrical load, installed.

The same as the previous.

Exploration.

The period during which drilling takes place in a potential oilfield, in order to determine more accurately its probable productivity.

Fired heater.

A device used in chemical plants and refineries to raise the temperature of a fluid, as a preliminary to further processing. Fuel (oil or gas) is burnt in a combustion chamber, and the fluid being heated circulates through tubes located in the walls of the chamber.

Feedstock.

Any raw material entering a chemical plant or oil refinery.

Formation.

A geological term, applied here to those layers under the sea-bottom in which crude oil and natural gas are found.

Gauger.

Originally a man who measured the levels of liquid in tanks. Now used as a term for a senior plant operator.

Liquefied petroleum gas (LPG).

A mixture, principally, of propane and butane. LPG is sold to owners of gas-fueled appliances in areas where natural gas is not available.

Loftsman.

A workman responsible for marking uncut structural steel and steel plate to the correct dimensions for cutting and welding.

Mastic.

A tar-like material used for coating steel surfaces, as a protection against corrosion.

Petrochemical.

Any chemical obtained, directly or indirectly, from petroleum. The term identifies the industries which use the various products of oil refineries as feed materials, from which to manufacture plastics, fertilizers, paints, and many other important items.

Pipeway.

In plants such as oil refineries, consisting of many pieces of equipment connected by pipes, the routing of the pipes presents a problem. If they are run haphazardly, maintenance and operation are more difficult and the plant is unsightly. Instead, the pipes are grouped along corridors, which run through the plant, and either rest on supports laid on the ground, or are carried on steel structures, high enough for men and vehicles to pass underneath.

Such corridors are called pipeways.

Production.

The period during which an oil-field is in operation, and pumping out crude oil and gas.

Roustabout.

A term taken from oilwell drilling, and used here to designate a junior plant operator.

Shipfiter.

A workman skilled in the assembly of structural steel, steel plate, etc.

Spread

The group of vessels assembled for the laying of a pipeline, or the installation of a platform. It consists of a number of barges, tugs and service vessels, the actual configuration depending on the task.

Workover.

In the course of time, the flow rate of oil out of a well will gradually fall. Part of the drop in flow will be due to a drop in the pressure in the oil-bearing formation. The rest of the drop will be due to degeneration of the well-bore itself, for one reason or another. Formation pressure can be maintained by pumping in water or gas. The well itself can be re-worked and re-drilled to improve flow. The latter process is called workover.

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